SD1 Variable Speed Inverter Drives
Basic Setup - Application Guide

Power and motor connections
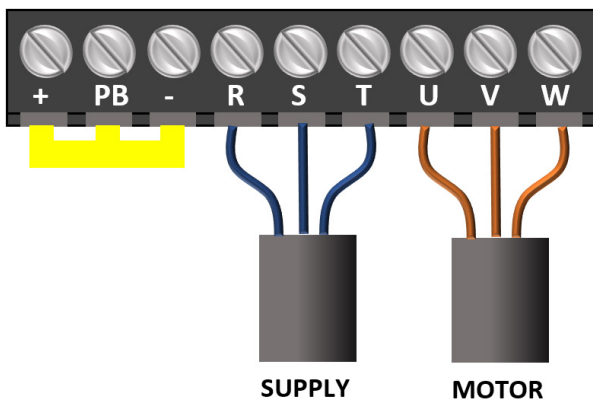
Terminal	Function
L, N	Single phase AC input terminals, connected to the power supply
R, S, T	Three phase AC input terminals, connected to the power supply
PB, (+)	External dynamic braking resistor terminal
(+), (-)	Input terminal of the DBU or DC bus
U, V, W	Three phase AC output terminals to motor
PE	Protective grounding terminal

SUPPLY   **MOTOR**

- Connect the ground wire of the input power cable to the ground terminal (PE) of the inverter and connect the 3PH input cable to the terminals R, S, and T, and fasten them up.

- Connect the ground wire of the motor cable to the ground terminal of the inverter and connect the 3PH motor cable to the terminals U, V, and W, and fasten them up.

1. How to set a parameter value

a. Press the `PRG ESC` key to access parameters.
When powered up, the SD1 inverter default display is: 50.00

P00 or the last viewed parameter will be displayed with the last digit flashing.

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IMO

b. Select the required parameter.

Use the up and down arrow keys to select the required parameter. In this example, select P00

Press the [DATA ENT] key to show parameters under the selected parameter group.

P00 is a parameter group and P00.01 is a parameter under the P00 group.

c. Change the parameter value and save.

Press the [DATA ENT] key to display the parameter value.

Use the up and down arrow keys to change the value as required.

Press the [DATA ENT] key to save the changes and return to the parameter list.

d. Return to the main operating display.

Once all parameter changes are complete, press [PRG ESC] key to return to the main operating display.

2. Motor Parameters (P02 Group Parameters)

The motor parameters are very critical for all applications. P02.01 to P02.05 parameters must be configured in the inverter as the same as that of the motor name plate details.

| Function Code	Name	Description	Default	Modify
P02.01	Rated power of async-motor	0.1 - 3000.0kW	Model Dependent	◎
P02.02	Rated frequency of async-motor	0.01Hz - P00.03	50.00Hz	◎
P02.03	Rated speed of async-motor	1 - 60000rpm	Model Dependent	◎
P02.04	Rated voltage of async-motor	0 - 1200V	Model Dependent	◎
P02.05	Rated current of async-motor	0.8A - 6000.0A	Model Dependent	◎

It is recommended to do an auto-tune after entering motor data into the inverter. Please configure the P00.15 parameter as suitable for the application. Please see section 3 for more details.

3. Motor Auto-tune
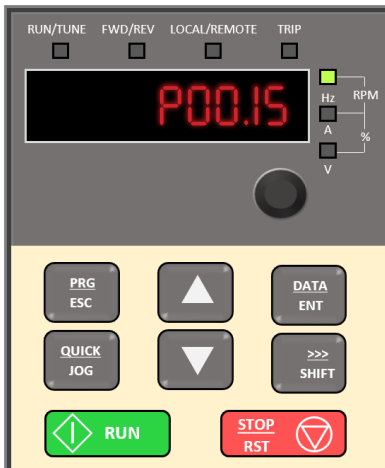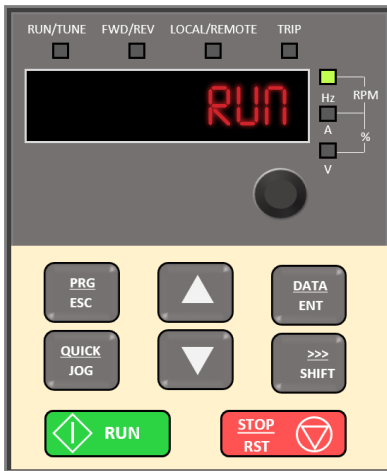
a. Press the **PRG ESC** key to access parameters.

   Go to parameter P00.15 and press **DATA ENT** to select the auto-tune mode (rotary or static).
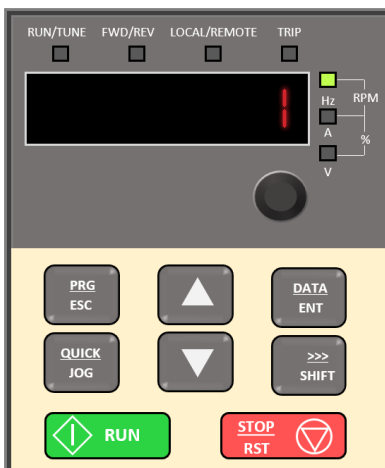
b. Select the required auto-tune mode and press **DATA ENT** .

c. Press the ◇ RUN button when the display shows RUN and the inverter will initiate the rotary or static auto-tune, displaying the following:

RUN-1 RUN-2 RUN-3

Note: Please configue P00.01 = 0 to initiate the RUN command from the keypad.

d. When the auto-tune is successfully done, the display will show END.

4. Frequency (Speed) Reference

The IMO SD1 inverters have two frequency channels – Frequency command A and Frequency command B, and the default frequency channel is A. Both the frequency channels have 9 different frequency or speed reference methods. Please see the below table for various frequency reference channel options.

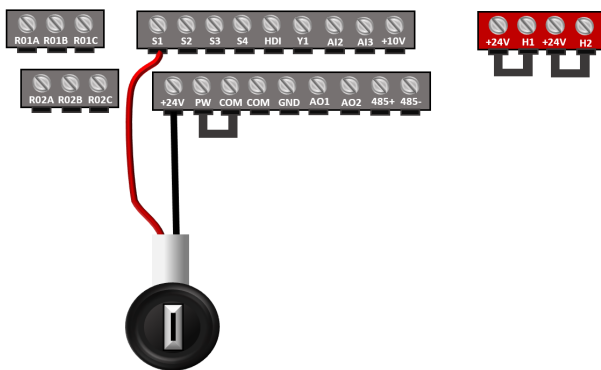| Function Code	Name	Description	Default
P00.06	A frequency command selection	**Note**: A frequency and B frequency cannot set as the same frequency reference method. The frequency source can be set by P00.09.	0
P00.07	B frequency command selection	0: Set via keypad digits Modify the value of function code P00.10 (set the frequency by keypad) to change the frequency by the keypad. 1: Set via AI1 (corresponding keypad potentiometer) 2: Set via AI2 (corresponding terminal AI2) 3: Set via AI3 (corresponding terminal AI3) Set the frequency by analog input terminals. SD1 series inverters provide 3 channels analog input terminals as the standard configuration, of which AI1 is adjusting through analog potentiometer, while AI2 is the voltage/current option (0~10V/0~-20mA) which can be shifted by jumpers, while AI3 is voltage input (-10V~+10V). **Note**: When analog AI2 select 0~20mA input, the corresponding voltage of 20mA is 10V. 100.0% of the analog input setting corresponds to the maximum frequency (P00.03) in forward direction and -100.0% corresponds to the maximum frequency in reverse direction (P00.03) 4: Set via high-speed pulse HDI The frequency is set by high-speed pulse terminals. SD1 series inverters provide 1 high speed pulse input as the standard configuration. The pulse frequency range is 0.00~50.00kHz. 100.0% of the high-speed pulse input setting corresponds to the maximum frequency in forward direction (P00.03) and -100.0% corresponds to the maximum frequency in reverse direction (P00.03).	2

Note: The pulse setting can only be input by multi-function terminals HDI. Set P05.00 (HDI input selection) to high-speed pulse input.

5: Set via simple PLC program
The inverter runs at simple PLC program mode when P0.06＝5 or P00.07＝5. Set P10 (simple PLC and Preset speed control) to select the running frequency running direction, ACC/DEC time and the keeping time of corresponding stage. See the function description of P10 for detailed information.

6: Set via Preset speed running
The inverter runs at Preset speed mode when P00.06＝6 or P00.07＝6. Set P05 to select the current running step and set P10 to select the current running frequency.
The Preset speed has the priority when P00.06 or P00.07 does not equal to 6, but the setting stage can only be the 1～15 stage. The setting stage is 1～15 if P00.06 or P00.07 equals to 6.

7: Set via PID control
The running mode of the inverter is process PID control when P00.06＝7 or P00.07＝7. It is necessary to set P09. The running frequency of the inverter is the value after PID effect. See P09 for the detailed information of the preset source, preset value, and feedback source of PID.

8: Set via Modbus communication
The frequency is set by Modbus communication.

9～11: Reserved

5. Digital Input - RUN Command

The diagram (left) illustrates the RUN command to the inverter via a digital input. The digital input is connected between S1 and +24V and uses the internal power supply of the inverter. For externally powered digital inputs, please remove the jumper link between the PW and COM and connect the input between S1 and PW.

| Function Code	Name	Value
P00.01	Run command channel	1: Terminal control
P05.01	S1 terminals function selection	1: Forward rotation operation

6. Analog Input

The SD1 series inverters have 3 analog input channels – AI1, AI2, and AI3. AI1 is the built-in internal potentiometer (keypad potentiometer) and can be used to adjust the speed/frequency of the inverter by configuring the parameter P00.06 = 1 (Frequency channel).

The AI2 analog input channel can accept a voltage signal (0-10V) or a current signal (0-20mA/4-20mA). Also, this channel is suitable for external potentiometer connection. The connection diagram below shows the external potentiometer connection via the AI2 or AI3 channel of the SD1 inverter. Please configure P00.06 = 2 if the speed reference is coming from AI2 analog input channel.

The AI3 analog input channel supports a -10V ～ +10V signal. Refer to parameters P05.32 ～ P05.48 for scaling and sensitivity settings of the analog signals.
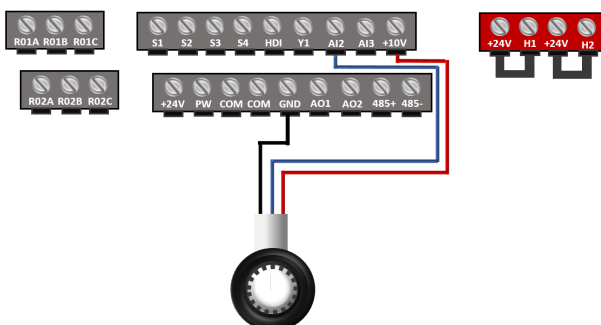
Please see below the dip switch chart for the analog signal type selection.
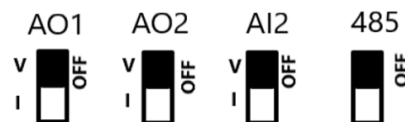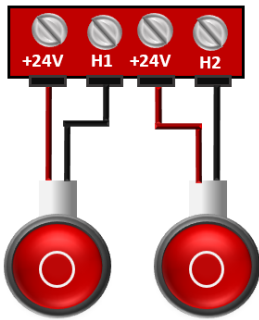
7. Safe Torque Off (STO)

Reference standards: IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, IEC 62061, ISO 13849-1, IEC 61800-5-2.

The SD1 series inverters have dual channel STO capability- H1 and H2 terminals. The STO terminals are isolated from the other control terminals through an internal safety relay. These internal safety relays ensure a higher degree of safety and protection. By default, there will be a jumper link between the +24V and H1, and H2. Please remove this jumper link for STO channel control via push buttons or switches. The below table indicates different possible STO alarm conditions.

STO input state	Corresponding STO fault
H1, H2 opens simultaneously	Trigger STO function, the drive can't operate normally
H1, H2 closes simultaneously	Don't trigger STO function, the drive can operate normally
Either H1 or H2 opens or closes	Trigger STL1/STL2/STL3 fault, fault code: 38: Safety circuit of channel 1 is abnormal (STL1) 39: Safety circuit of channel 2 is abnormal (STL2) 40: Internal circuit is abnormal (STL3)

Note: Please configure P11.16 = 100 to reset the STO alarm after the state recovery without any power restart. It is highly recommended to use the internal +24V itself for STO channels instead of the external +24V supply. Connect the input between H1, H2, and COM in case of external +24V supply.

8. Fault Codes

Fault Code	Fault Type	Possible Cause	Solutions
OUt1	IGBT Ph-U fault	• Acceleration is too fast. • IGBT module damaged. • Misacts caused by interference. • The connection of the drive wire is not good. • To-ground short circuit.	• Increase acceleration time. • Replace the power unit. • Check drive wires. • Check whether there is strong interference caused by external equipment.
OUt2	IGBT Ph-V fault		
OUt3	IGBT Ph-W fault		
OC1	Over-current during acceleration	• Acceleration is too fast. • Grid voltage is too low. • inverter power is too small. • Load transients or is abnormal. • To-ground short circuit or output phase loss occur. • There is strong external interference. • The overvoltage stall protection is not open.	• Increase acceleration time. • Check input power. • Select the inverter with a larger power. • Check if the load is short circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth. • Check the output wiring. • Check if there is strong interference. • Check the setting of related function codes.
OC2	Over-current during deceleration		
OC3	Over-current when running at constant speed		
OV1	Over-voltage during acceleration	• The input voltage is abnormal. • There is large energy feedback. • No brake components. • Braking energy is not open.	• Check the input power. • Check if the load deceleration time is too short or the inverter starts during the rotation of the motor, or it is necessary to install dynamic braking components. • Install the brake components. • Check the setting of related function codes.
OV2	Over-voltage during deceleration		
OV3	Over-voltage when running at constant speed		
UV	DC bus under-voltage	• The voltage of the power supply is too low	• Check the input power of the supply line.
OL1	Motor overload	• The voltage of the power supply is too low. • The motor setting rated current is incorrect. • The motor stall or load transients is too strong.	• Check grid voltage. • Reset the rated current of the motor. • Check the load and adjust the torque lift.
OL2	inverter overload	• Acceleration is too fast. • Restart the rotating motor • Grid voltage is too low. • The load is too heavy. • The rated power is much larger than the power needed.	• Increase acceleration time. • Avoid restarting after stopping. • Check the grid voltage. • Select an inverter with larger power. • Select a proper motor.
OL3	Electrical overload	• The inverter will report overload pre-alarm according to the set value.	• Check the load and the overload pre-alarm point.
SPI	Input phase loss	• Phase loss or fluctuation of input R, S, T.	• Check input power • Check installation wiring.
SPO	Output phase loss	• U, V, W phase loss output (or serious asymmetrical three phase of the load).	• Check the output wiring. • Check the motor and cable.

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Fault Code	Fault Type	Possible Cause	Solutions
OH1	Rectify overheat	• Air duct is blocked, or fan is damaged. • Ambient temperature is too high. • The time of overload running is too long.	• Refer to the overcurrent solution. • Redistribute. • Dredge the wind channel or change the fan. • Lower down the ambient temperature. • Check and reconnect. • Change the power. • Change the power unit. • Change the main control panel.
OH2	IGBT overheat		
EF	External fault	• SI external fault input terminals acts.	• Check the external device input.
CE	Communication error	• The baud rate setting is incorrect. • Fault occurs to the communication circuit. • The communication address is wrong. • There is strong interference to the communication.	• Set proper baud rate. • Check the wiring of communication connection interface. • Set proper communication address. • Change or replace the wiring or improve the anti-interference capability.
ItE	Current detection fault	• The connection of the control board is not good. • Assistant power is bad. • Hall components is broken. • The magnifying circuit is abnormal.	• Check the connector and plug wire again. • Change the hall. • Change the main control panel.
tE	Autotuning fault	• The motor capacity does not match with inverter capacity. • The rated parameter of the motor is set improperly. • The deviation between the parameters from autotune and the standard parameter is huge. • Autotune overtime.	• Change the inverter model; Set the rated parameter according to the motor nameplate. • Empty the motor load; Check the motor connection and set the parameter. • Check if the upper limit frequency is above 2/3 of the rated frequency.
EEP	EEPROM fault	• Error occurred to R/W of the control parameter. • EEPROM is damaged.	• Press STOP/RST to reset. • Change the main control panel.
PIDE	PID feedback fault	• PID feedback offline. • PID feedback source disappear.	• Check the PID feedback signal wire. • Check the PID feedback source.
bCE	Braking unit fault	• Braking circuit fault or damage to the brake pipes. • The external braking resistor is not sufficient.	• Check the braking unit and change to new brake pipe; • Increase the braking resistor.
END	Time reach of factory setting	• The actual running time of the inverter is larger than the internal setting running time.	• Ask for the supplier and adjust the setting running time.
PCE	Keypad communication error	• The keypad is not in good connection or offline. • The keypad cable is too long and there is strong interference. • Part of the communication circuits of the keypad or main board have fault.	• Check the keypad cable and ensure it is normal. • Check the environment and eliminate the interference source. • Change hardware and ask for maintenance service.
UPE	Parameter upload error	• The keypad is not in good connection or offline. • The keypad cable is too long and there is strong interference. • Part of the communication circuits of the keypad or main board have fault.	• Check the environment and eliminate the interference source. • Replace the hardware and ask for maintenance service. • Change hardware and ask for maintenance service.
DNE	Parameter download error	• The keypad is not in good connection or offline. • The keypad cable is too long and there is strong interference. • Data storage error in keypad.	• Check the environment and eliminate the interference source. • Replace the hardware and ask for maintenance service. • Backup data in the keypad again.
ETH1	Grounding shortcut fault 1	• The output of the inverter is short circuited to the ground. • There is fault in the current detection circuit. • There is a great difference between the actual motor power setting and the inverter power.	• Check if the connection of the motor is normal or not. • Replace the hall. • Replace the main control panel. • Reset motor parameters and ensure those parameters are correct. • Check whether motor power parameters in P2 group are consistent with the motor power used.
ETH2	Grounding shortcut fault 2		
LL	Electronic underload fault	• The inverter will report the underload pre-alarm according to the set value.	• Check the load and the underload pre-alarm point.
STO	Safe torque off	• STO function operates normally	
STL1	Channel H1 abnormal	• Fault or internal hardware circuit fault occurred to H1 channel	• Replace STO switch; if problem persists after replacement, contact the manufacturer.
STL2	Channel H2 abnormal	• Fault or internal hardware circuit fault occurred to H2 channel	
STL3	Internal circuit abnormal	• Fault or internal hardware circuit fault occurred to H1 and H2 channels simultaneously	
CrCE	Safe code FLASH CRC check fault	• Error occurred to STO safe code FLASH CRC check	• Contact IMO.